

Massachusetts Institute of Technology  
C. S. Draper Laboratory  
Cambridge, Massachusetts

LUMINARY Memo #145

To: Distribution  
From: Dana Densmore  
Date: 5 May 1970  
Subject: LUMINARY Revisions 148-151

The following changes were incorporated into LUMINARY revisions 148-151.

- 1) (PCR 1015) Coding at V90PERF to check for average G on was changed to use a BZF instead of a CCS (saving a word).
- 2) (PCR 988) Coding for Auto P66 was implemented, for automatic nulling of horizontal velocity when the surface becomes obscured. This is analogous to what went into LUMINARY 1C on the second re-release.
- 3) (PCR 970.2) The Gyro Torquing Routine was modified so that pulse torquing will always finish with the same polarity pulses.
- 4) (PCR 302.2)
  - a) Channels 76 and 77 were defined.
  - b) Channels 76 and 77 were added to the downlists in place of CADRFLSH and CADRFLSH +1.
  - c) Channel 77 was zeroed in Fresh Start and in the update program after the update is received and verified.Channel 77 is being added to the hardware. It will indicate the exact cause of a hardware restart.
- 5) (PCR 1013) The erasables 2LATE466, CNTTHROT, and TOOFEW were defined in E5 and E7 and coding for the implementation of multiple servicers avoidance in P66 was put in.

6) (ACB L-17)

- a) Bits 4 and 6 instead of just bit 6 were left alone while the others were reset in channel 14 on a software restart to prevent resetting of thrust enable as well as gyro enable. This was so that if a software restart occurs during the throttle down of the DPS engine the pulses to the DECA will not be temporarily terminated.
- b) A restart point (TC FASTCHNG) was put in after the return from THROTTLE to prevent the program from sending out two of the same throttle commands. (If a restart occurs in the middle of THROTTLE, an error of approximately 10 pounds in the thrust may result. However this will be corrected on the next pass.)

7) (PCR 896)

- a) Coding was added at PREREAD to reset the data good bits of RADMODES.
- b) A "MASK ITEMP1", which was erroneously dropped when the original coding was implemented, was put in now.
- c) A change was made to fix the velocity incorporation scaling.
- d) The check on PSTHIBIT before checking for HIGATE was replaced at HIGATCHK and the HIGATE check bypassed if PSTHIBIT was set.

8) (PCR 256) When DLAND was moved to E5 one of the necessary EBANK settings (in TTFINCR) was not changed. This was done now.

9) (L-18) STEER? and RATESTOP were rewritten to clean up the exit from landing guidance. (These changes were implemented in 1C along with the Auto P66 changes.) (1) The order of the logic was changed to check for overflow before checking STEERSW. Formerly the checks were made in reverse order. (2) The attitude hold check was omitted and instead a ratestop was done, even though it duplicates the rate stop action of FINDCDUW if the vehicle is in attitude hold.

- 10) (L-16) A correction was made to solve a possible problem on a restart in P64 (Luminary 1C Program Note 53 dated 6 February 70). Such a restart could have resulted in random branching if a job request in the throttle routines is left in the restart point and has not been satisfied at the time P66 is entered. To correct the problem P66 is now called via "TC POSTJUMP, FCADR THROT66," instead of with a BANKCALL (whose return could be destroyed in the restart routine). At THROT66 a TC call to THROTTLE +3 was made, then CNTTAROT was incremented, then DISPEX66 was called with a TCF. Formerly the throttle call in P66 called THROTTLE +3 with a BANKCALL, then upon returning incremented CNTTHROT and TCFed to DSPEX66 (formerly called DISPEXIT +3).
- 11) (ACB L-10) The standard updates done by the ground via the P27 universal update program are described in chapter 2 of the GSOP with the ECADRs for each one. A new log section, Absolute Addresses for Update Program, and a new assembler op code =ECADR, provide this information for each revision. =ECADR calculates and prints out the ECADR for the tag specified without generating an actual constant. Five ECADRs were provided: UPSVFLAG, XSMD, REFSMMAT, DELVSLV, and RLS.
- 12) (PCR 298) A change was made at LRPOSCAN to CAF FOUR instead of FOURTEEN to change the limit put into SAMPLIM from 15 samples to 5, in order to change the time for completion of LR reposition from 21 seconds to 10 seconds.
- 13) (PCR 296) P68 was changed to make the gravity vector (GSAV) parallel to the LGC landing site radius vector (RLS) instead of being parallel to the LM X body axis as it was formerly. The angle between the LGC navigated landing site radius vector and the measured gravity vector is a more pertinent quantity to display since the LM body attitude is well defined by attitudes at landing.

- 14) (PCR 996) A change was put in to prevent selection of P07 in flight. At V92 (SYSTEST) a check on a flagword is now made and if it is during flight the operator error is turned on and we exit. The flag will be set properly at padload time for the LM. The original PCR (996) specified that the error procedure for this was a POODOO alarm, but PCN 1033 modified it to call for the ALM/END procedure.

Changes to LUMINARY GSOP:

Section 4 should reflect the changes described above in (2), (4), (5), (6), (7), (9), (12), and (14).

Section 2 should reflect the changes described above in (2), (4), (6), (8), and (11).

Section 3 should reflect the change described above in (3).

Section 5 should reflect the changes described above in (12) and (13).